

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A component comprising:
~~a silicon-based substrate~~ a substrate formed of silicon nitride or silicon carbide; and
a protective coating for the substrate, the protective coating including tantalum oxide (Ta_2O_5) and an additive for suppressing transformation from beta Ta_2O_5 to alpha Ta_2O_5 ;
wherein the amount of tantalum oxide is ~~greater than at least~~ about 40 50 mol%; and
wherein the protective coating is substantially crystalline and
10 wherein a presence of ~~CaO~~ is eliminated.
2. (Currently Amended) The component according to Claim 1, wherein the additive is an oxide, compound, or precursor thereof, of at least one an element chosen from the group consisting of Al, Hf, Si, Ln (rare earth including whole lanthanum series and yttrium) Mg, Mo, Ni, Nb, Sr, and Ti.
3. (Currently Amended) The component according to Claim 2, wherein the coating further includes at least one an additive selected from the group consisting of nitrides, carbides, borides and silicides.
4. (Original) The component according to Claim 1, wherein the substrate is one of a silicon nitride substrate and a silicon carbide substrate.

5. (Previously Presented) The component according to Claim 1, wherein the additive is aluminum oxide (Al_2O_3).

6. (Original) The component according to Claim 5, wherein the aluminum oxide is in the range of about 1-50 mol% during application of the coating.

7. (Original) The component according to Claim 5, wherein the aluminum oxide is based on starting material in the range of about 1-50 mol%.

8. (Previously Presented) The component according to Claim 5, wherein the additive further includes La_2O_3 .

9. (Original) The component according to Claim 8, wherein the La_2O_3 is in the range of about 1 -10 mol% during application of the coating.

10. (Original) The component according to Claim 8, wherein the La_2O_3 is based on starting material in the range of about 1 -10 mol%.

11. (Currently Amended) A component, comprising:
a substrate formed of silicon nitride or silicon carbide; and
a protective coating of crystalline composition on an outer surface of the substrate; and

5 the protective coating including a mixture of tantalum oxide (Ta_2O_5) and an additive of at least one of Al_2O_3 and La_2O_3 ;
herein the amount of tantalum oxide is greater than at least 40 50 mol%; and
~~wherein a presence of CaO is eliminated.~~

12. (Original) The component according to Claim 11, wherein the Al₂O₃ is in the range of about 1-50 mol%.

13. (Original) The component according to Claim 11, wherein the La₂O₃ is in the range of about 1-10 mol%.

14. (Original) The component according to Claim 11, wherein a surface of the coating has needle-shaped La₂O₃ – Ta₂O₅ precipitates.

15. (Currently Amended) A method of protecting a silicon nitride (Si₃N₄) or silicon carbide (SiC) substrate against repeated thermal cycles at elevated temperatures, the method comprising:

mixing an additive including an oxide, compound or precursor thereof, of at least one ~~an~~ element chosen from the group consisting of Al, Hf, Si, Ln (rare earth including whole lanthanum series and yttrium) Mg, Mo, Ni, Nb, Sr, and Ti with a quantity of tantalum oxide (Ta₂O₅) powder to form a mixture, wherein the quantity of tantalum oxide is ~~greater than~~ at least 40 about 50 mol% and ~~wherein a presence of CaO is eliminated~~;

10 preheating the mixture; and
 applying the heated mixture to the substrate.

16. (Original) The method according to Claim 15, further comprising firing the substrate and applied mixture to form a solidified protective coating on the substrate having a thickness between 0.5 to 10 mil.

17. (Previously Presented) The method according to Claim 15, wherein the additive includes aluminum oxide (Al₂O₃) in the range of about 1-50 mol%.

18. (Previously Presented) The method according to Claim 15, wherein the additive includes La_2O_3 in the range of about 1-10 mol%.

19. (Original) The method according to Claim 15, wherein the mixture is preheated to a temperature of about 1000°C before applying the mixture to the substrate.

20. (Original) The method according to Claim 15, further comprising heating the mixture to a temperature of about 1600°C and then grinding the mixture before applying the mixture to the substrate.

21. – 22. (Cancelled) -

23. (Currently Amended) A component comprising:

~~a silicon-based substrate~~ a substrate formed of silicon nitride or silicon carbide; and

5 a protective coating for the substrate, the protective coating including tantalum oxide (Ta_2O_5) and La_2O_3 for suppressing transformation from beta Ta_2O_5 to alpha Ta_2O_5 , the La_2O_3 being in the range of about 1-10 mol% before application of the coating;

10 wherein the protective coating further includes ~~is~~ an oxide, compound, or precursor thereof, of at least one an-element chosen from the group consisting of Al, Hf, Si, Ln (rare earth including whole lanthanum series and yttrium), Mg, Mo, Ni, Sr, and Ti.

24. (Currently Amended) The component according to Claim 23, wherein the coating further includes at least one an additive selected from the group consisting of nitrides, carbides, borides and silicides.

25. (Currently Amended) A method of applying a protective coating onto a silicon-based substrate, the method comprising:

mixing Ta₂O₅ powder with AlO₃ powder to create a ceramic mixture, wherein the Ta₂O₅ is at greater than at least about 40 50 mol%;

5 roughening the silicon-based substrate surface;
degreasing the silicon-based substrate surface;
preheating the silicon-based substrate to about 1000°C;
applying the ceramic mixture onto the silicon-based substrate surface with an air-plasma spraying process;
10 melting the ceramic mixture;
quenching the silicon-based substrate; and
solidifying the ceramic mixture into a protective coating.

26. (Previously Presented) The method of claim 25, wherein the silicon-based substrate comprises silicon nitride (Si₃N₄).

27. (Previously Presented) The method of claim 25, wherein the silicon-based substrate comprises silicon nitride (SiC).

28. (Previously Presented) The method of claim 25, wherein the protective coating thickness is in the range of about 50 microns to about 250 microns.

29. (Previously Presented) The method of claim 25, wherein the AlO₃ concentration is in the range of about 25 mol% before applying the ceramic mixture onto the silicon-based substrate.